# Hardware Enables Multimedia

CHAPTER- 07

# Hardware Enables Multimedia

- Input and Output Devices
- Virtual Reality Devices
- Modems and Network Interfaces

# Input and Output Devices

## Output Devices

Monitors

Speakers and MIDI interfaces

VR helmets and immersive displays

## Input Devices

Keyboards

Digital cameras, scanners, & CD-ROMs

MIDI keyboards and microphones

Video cameras

trackballs, joysticks

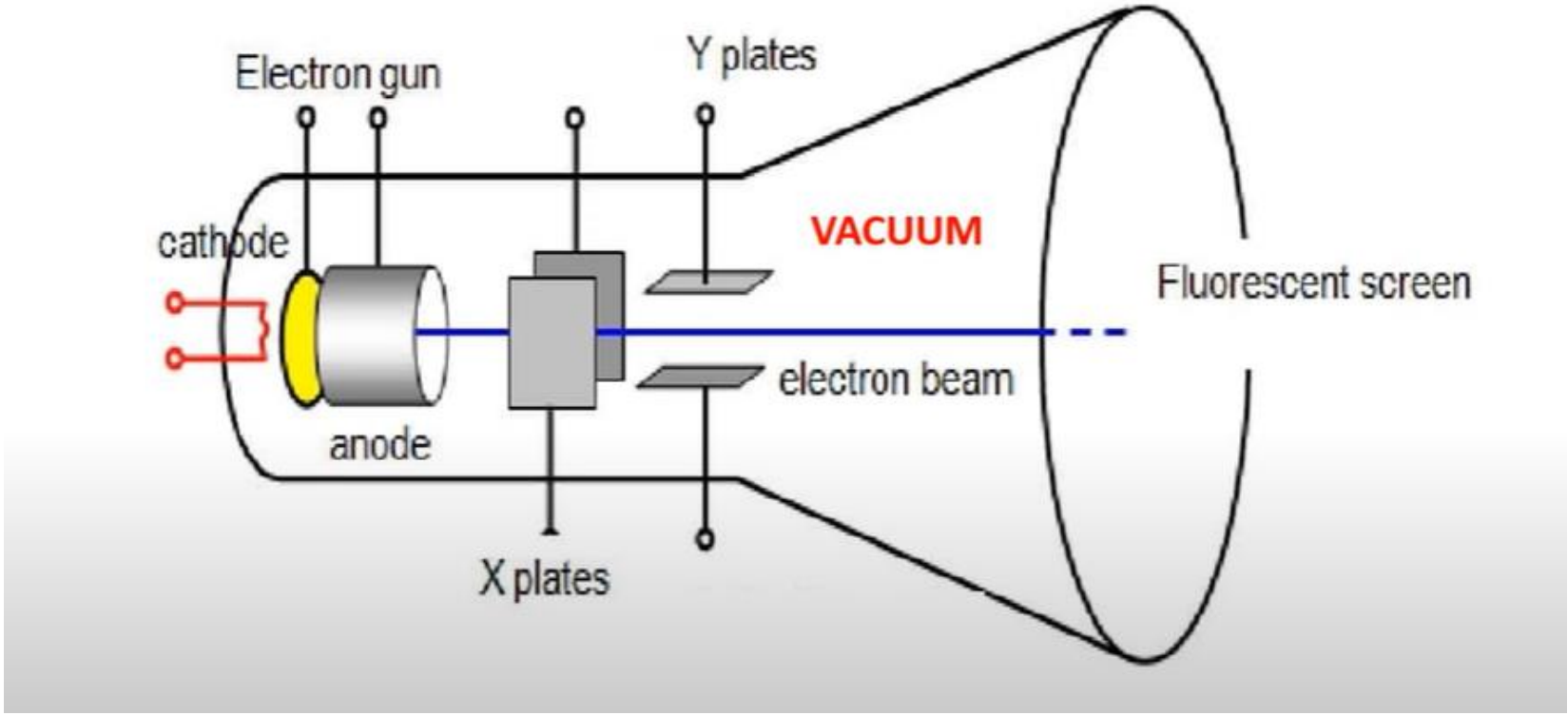
# Monitors

- CRT(Cathode Rays Monitors)
- LCD(Liquid Crystal Display Monitors)
- LED(Light Emitting  Diodes Monitors)

# CRT(Cathode Rays Monitors)

- A CRT (cathode-ray tube) monitor is an analog display device that creates a visible image on the screen by directing three electron beams over millions of phosphor dots to make them light up.
- In a color monitor, the screen is composed of numerous stripes of alternating red, green, and blue phosphor dots, which get activated by the electrons and combine to make countless different hues.

# CRT(Cathode Rays Monitors)



# Advantages of CRT

- Less expensive than other display technology.
- Fast response time.
- It can operate at any resolution, geometry and also for aspect ratio without the need for rescaling the image.
- Highest pixel resolutions generally available.
- They produce more colors.
- CRT also suitable for use even in dim or dark light.

# Disadvantages of CRT

- Big back and take up space on a desk.
- Not suitable for very brightly environment because less bright than LCD.
- They are large, heavy and bulky.
- Consume a lot of electricity and also produce a lot of heat.
- Geometrical error at edges.
- Flickering at 50-80 Hz.
- Harmful DC and AC electric and magnetic fields.

# LCD(Liquid Crystal Display Monitors)

- Liquid crystal display, also known as liquid crystal diode, is one of the most advanced technologies available at present.
- Optical effect is achieved by polarizing the light in varying amounts and making it pass through the liquid crystal layer.
- At present, there are two types of LCD technology available. These include the active matrix or TFT and passive matrix technology. Among these, TFT technology is more secure and reliable and generates better picture quality. On the other hand, the passive matrix has a slow response time and is slowly becoming outdated

# LCD(Liquid Crystal Display Monitors)

# Advantages of LCD

- These monitors are compact, lightweight, and do not consume much desk space. Fast response time.
- Do not consume much electricity and can even be operated by using batteries.
- Images transmitted by these monitors do not get geometrically distorted and have little flicker.
- Is very thin compared to a CRT monitor.
- Can be made in almost any size or shape.
- Can be made to large sizes (more than 24 inches) lightly and relatively inexpensively

# Disadvantages of LCD

- Limited viewing angle.
- Uneven backlighting in some (mostly older) monitors, causing brightness distortion, especially toward the edges.
- Dead or stuck pixels may occur during the manufacturing or through use.
- Poor display in direct sunlight, often completely unviewable. – Cannot be used with light guns/pens.
- It is Hard to read when wearing polarized sunglasses.

# LED(Light Emitting  Diodes Monitors)

An **LED monitor** is an advanced LCD screen that uses light-emitting diodes to **display** images, as opposed to the cathode ray tubes used in older-style **monitors**.

LED monitors are said to use much lesser power than CRT and LCD. Thus, they are also considered environmentally friendly.

# Advantages of LED

- They produce images with higher contrast
- They have less negative environmental impact when disposed
- Lifespan and durability of LED monitors is more than CRT or LCD monitors.
- Because of the technology, the monitor panels can be made very thin.
- Do not produce much heat while running

# Disadvantages of LED

- LEDs are more expensive than conventional lighting technologies
- LEDs can shift color due to age and temperature
- LED is a lot thinner than the LCD or Plasma.
- Contrast ratios not consistent
- Much higher price

# Measurements of performance

- The performance of a monitor is measured by the following parameters
  - Color depth is measured in bits per primary color or bits for all colors.
  - Gamut is measured as coordinates in the CIE 1931 color space. The names sRGB or AdobeRGB are shorthand notations.
  - Aspect ratio is the ratio of the horizontal length to the vertical length. Monitors usually have the aspect ratio 4:3, 5:4, 16:10 or 16:9.
  - Viewable image size is usually measured diagonally, but the actual widths and heights are more informative since they are not affected by the aspect ratio in the same way. For CRTs, the viewable size is typically 1 in (25 mm) smaller than the tube itself.
  - Display resolution is the number of distinct pixels in each dimension that can be displayed. For a given display size, maximum resolution is limited by dot pitch.

# Measurements of performance

Dot pitch is the distance between sub-pixels of the same color in millimeters. In general, the smaller the dot pitch, the sharper the picture will appear.

Refresh rate is the number of times in a second that a display is illuminated.

Response time is the time a pixel in a monitor takes to go from active (white) to inactive (black) and back to active (white) again, measured in milliseconds. Lower numbers mean faster transitions and therefore fewer visible image artifacts.

Contrast ratio is the ratio of the luminosity of the brightest color (white) to that of the darkest color (black) that the monitor is capable of producing.

# Latest Display Techs

OLED(Organic LED)

QD-OLED( Quantum Dot LED) - made its official debut at CES 2022

Micro-LED

# Speakers and MIDI interfaces

- Speakers are transducers that convert electromagnetic waves into sound waves. The speakers receive audio input from a device such as a computer or an audio receiver. This input may be either in analog or digital form.

- Analog speakers simply amplify the analog electromagnetic waves into sound waves. Since sound waves are produced in analog form, digital speakers must first convert the digital input to an analog signal, then generate the sound waves.

- The sound produced by speakers is defined by frequency and amplitude.

- The frequency determines how high or low the pitch of the sound is. Amplitude, or loudness, is determined by the change in air pressure created by the speakers' sound waves.
- Eg: blutooth speaker: Sonos Roam,  UE boom 3, JBL flip 6

# Speaker Types by use

Various types of speaker are used in PA systems, each with a different purpose.

Main speakers – These are the speakers that deliver most of the sound to the audience or listeners. Decide on the size and number of speakers according to the size of the venue, as well as by the amplifier output power (in the case of passive speakers).

Subwoofers – These speakers are designed specifically for low frequency sound playback, and are used together with the main speakers to boost the low-end sound range.

Monitor speakers – These speakers are used by the performers to monitor the sound. Monitor speakers are positioned in various ways depending on their shape, such as on the floor or on a stand

# Speakers and MIDI interfaces

MIDI interfaces are a great tool for creative musicians who want to experiment with different instruments in their compositions.

MIDI (*Music Instrument Digital Interface*) sends signals to other controllers such as synths and keyboard controllers to operate digitally on computers. Unlike audio transmissions, it does not carry sound. Instead, it transmits data that is formed into binary codes (1's and zeros).

# VR helmets and immersive displays

With a headset and motion tracking, VR lets you look around a virtual space as if you're actually there, or play a game as though you're in it. VR's been gaining traction in recent years thanks to compelling games and experiences, though it still seems very much in a state of flux, with headsets coming and going fairly rapidly.

Usage: In sports, Games, training, education


# Microphone types

- It is often taught that "sound is vibrations in the air." We are able to enjoy music because we sense these vibrations in the air as sound. Microphones convert these vibrations into electrical signals. Here are the three main types of microphone:
  - **Dynamic Microphone**
    - Construction is simple and comparatively sturdy.
    - No power supply is required.
    - Relatively inexpensive.
    - Use on stage or any live or noisy situation

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  - **Condenser Microphones**
    - Good sensitivity at all frequencies.
    - The power supply is required.
    - Vulnerable to structural vibration and humidity.
    - Use in the studio with low noise, recording vocals, recording guitar and other high-frequency instruments, needing to capture subtle details, the sound source isn't extremely loud.

# Microphone types

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  - **Ribbon Microphones**
    - offer even more detail than condenser mics.
    - Very expensive
    - Use in in the studio seeking a warm and vintage sound. These are rare, fragile, and expensive.

# Which type of microphone should I use?

- When picking out a microphone, the first thing to decide is what type of microphone you need. If you're a vocalist who records in studios, a condenser mic is a smart choice. However, for anyone who performs live, a **dynamic mic** should be your go-to microphone.
- Condenser microphones may have greater appeal because they have "good sensitivity at all frequencies". However, they are not always the most practical choice.
- Often during recording, a "pop shield" filter is required to protect against noise caused by the vocalist's breath hitting the condenser microphone.
- This is because condenser microphones are able to react to more subtle sounds. On the other hand, condenser microphones are not suited for high-volume recording, so dynamic microphones are mainly used in situations where loud audio is to be picked up

# Video Capture Card

Converting analog video signals, such as those generated by a video camera, into a digital format and then storing the digital video on a computer's mass storage device.

Video capture from analog devices requires a special video capture card that converts the analog signals into digital form and compresses the data.

There are also digital video devices that can capture images and transfer them to a computer via a standard serial or parallel interface.

# Joy Stick

A joystick is an input device that allows the user to control a character or machine in a computer program, such as a plane in a flight simulator.

They look similar to the control device you would find on an arcade game, but nearly always include extra buttons for additional functionality